

EFFECT OF SEED TREATMENT ON PLANT GROWTH, SEED YIELD AND QUALITY OF CHICKPEA VARIETIES

GNYANDEV, B. M. B. KURDIKERI & P. M. SALIMATH

University of Agricultural Sciences, Dharwad

ABSTRACT

The field experiment were conducted to know the effect of seed treatment on plant growth, seed yield and quality in two chickpea varieties A-1 (desi) and KAV -2 (kabuli) during rabi seasons of 2007 and 2008 at main agricultural Research station, University of Agricultural sciences, Dharwad. The study revealed that seeds treated with Rhizobium followed by PSB resulted in higher number of branches, pods per plant, test weight, seed yield in A1 (31.25 & 28.15) respectively. While maximum plant height was recorded in ICCV-2 variety treated with rhizobium followed by PSB treatment (50.27 & 25.22). The seed quality parameters were more in seed treatment of rhizobium followed by PSB, compared to other treatment & control in both chickpea varieties.

KEYWORDS: *Effect of Seed Treatment on Plant Growth, Seed Yield and Quality of Chickpea Varieties*

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INTRODUCTION

Pulses are the cheapest and rich sources of quality protein and amino acids. They play a major role in crop rotation because they keep the soil alive and productive by enriching the soil fertility in terms of nitrogen and organic matter. Among pulses, chickpea is the third most important pulse crop in the world and it is used in preparation of many sweets, chats snacks and food studs. It contains easily digestible protein (21.1%), carbohydrate (61.51%), fat (4.5%) and relatively free from anti nutritional factors (Saxena, 1990).

Since, chickpea has greater economics and nutritive value much emphasis is being given for increasing its area and production as well as productivity by adopting some agronomic and seed production practices. Among several practices, seed treatment with small quantity of micronutrients and biofertilizers plays an important role in increasing seed yield and quality in many field crops. Chickpea is highly responsive to chemical fertilizers specifically phosphorus in increasing seed yield and quality in many field crops. In view of escalating prices of chemical fertilizers there is a strong need for alternative source of nitrogen and phosphorous such as bio fertilizers which are cheaper, pollution free and renewable (Jain *et al.*, 1999). Direct application of nutrients to soil is a problematic one as the quantity of nutrient requirement will be more and efficiency of nutrients utilization is also poor. Hence, application of nutrients through seed treatment seems to be more economic as nutrients will be available immediately to the growing seedling (Vijaya, 1996).

MATERIAL AND METHOD

Genetically pure seeds of chickpea cv. A-1 and ICCV-2 was obtained from the department of Genetics and

Plant Breeding, University of Agricultural Sciences, Dharwad. The bulk seeds were graded using 5x5 mm (R) metal sieve and were used for the study. The seeds were treated with T₁ – Zinc sulphate (1 g/kg of seed), T₂ - Calcium chloride (1 g/kg of seed), T₃- Ferrous sulphate (1g/kg of seed), T₄- Boron (1g/kg of seed), T₅- Magnesium sulphate (1g/kg of seed), T₆- Rhizobium (20 g/kg seeds) T₇- Phosphorus solubilizing bacteria (PSB) (20 g/kg seeds), T₈- 3% Panchagavya (soaking) and T₉- Control. The treated seeds were dried under shade for 6-8 hours and seed for sowing. The observations on plant height, number of branches, number of pods per plant, seed yield per hectare, germination percentage (ISTA, 1999), seedling length, seedling dry weight, vigour index (Abdulbaki and Anderson, 1975) and electrical conductivity were recorded in both the year. The results of pooled data are presented in tables.

RESULTS AND DISCUSSIONS

In the present investigation plant eight and number of branches found to differ significantly in chickpea varieties irrespective of seed treatments. ICCV-2 recorded more (49.65 cm) plant height compared to A-1. But the highest (23.73) number of pod bearing branches were recorded in A-1 variety. The differences in plant height and number of branches might be attributed to genetic makeup of the variety (Pomaet *al.*, 1990). In many field crops it is evident that yield is a function of number of pods per plant, number of seeds per pod and test weight. The highest (44.03) number of pods per plant was recorded in A-1 variety compared to ICCV-2 (35.75). Similarly the seed yield per hectare recorded was maximum (30.12 q) in A-1 compared to ICCV-2 (26.49 q) The significant difference in seed yield noticed between variety is mainly due to the variations in the number of productive branch, number of pods per plant, test weight of seed etc which are governed by the genetic character of variety. Similar varietal differences on seed yield and yield parameters were reported by Siag and Verma (1995) and Merwade (2000) in chickpea. Observations on germination percentage and electrical conductivity of seed leachates showed no significant difference while, seedling vigour index was scientifically more (2703) in ICCV-2 compared to A-1 variety.

It is evident from tables that application of micronutrients and biofertilizers through seeds in small quantity showed beneficial influences in plant growth, seed development, seed yield and yield traits besides, seed quality parameters in both the chickpea varieties. In the present study, irrespective of varieties and seed treatment, the mean plant height at harvest was significantly more 50.36 cm in (20 g/kg) rhizobium inoculation followed by PSB , ZnSO₄ and MgSO₄ compared to control (46.56cm). The mean number of branches also followed the same trend. The increase in plant growth and number of branches may be ascribed to increased supply of nutrients in rhizobium inoculation treatment and the results are in conformity with jainet *al.* (1990 in chickpea and Patel (1991) ion pea. The rhizobiums helps more fixation of atmospheric nitrogen in nodules containing aspergine and glut a thiamin results in increase of production of protein, carbohydrate ad starch for higher dry matter accumulation and branches per plant (Ready and Reddi, 1992).

With respect to yield and yield parameters marked difference was notices among different seed treatments. Higher Mean seed yield per ha (30.07 q) was obtained in rhizobium seed treatment followed by PSB compared to other treatments and control. The increase in mean seed yield with these two treatments may be due to more nitrogen availability through increased nitrogen fixation, higher number of pods per plant, seeds per pod and yield attributes via higher photosynthetic rate and their translocation to sink, contribute for higher seed yield (Chatarjii, 2001 and Kushwaha, 2008) in chickpea. Further, inoculation of rhizobium and PSB are known to produce the endogenous growth regulators and release ammonia from rhizobim and supply phosphorous nutrients by solubilizing insoluble phosphate by PSB resulting in higher yield (Prabhakaranet *al.*, 1999).

Besides higher seed yield, the better seed quality attributes such as 100 seed weight, (25.66 g), germination (96.66%), viour index (2922) were found to be maximum with rhizobium seed treatment. Generally, the seed quality is associated with bigger seed size, higher seed weight and food reserves. Germination and seedling growth depend on initial seed quality and supply of food reserves. Similar higher seed quality attributes were noticed with rhizobium (20 g/kg) seed treatment by Upadhyaya *et al.* (1999) in green gram.

Seed leach ate values indicate overall seed development, maturity and membrane integrity and seed quality. The amount of seed leachate (EC values) is in versely related to seed quality; lower the seed leachate values better is the seed quality and vice versa. In the present study also, lower EC (0.422 dSm⁻¹) value was recorded with rhizobium followed by PSB (0.425 dSm⁻¹) compared to other treatments.

The interaction between varieties and seed treatments with micronutrients and bio-fertilizers was none significant on plant height and number of braces. Similarly the seed yield parameters were also not influenced by the seed treatments in both chickpea varieties except number of pods per plant which was significantly maximum (48.75) in V₁ T₆ followed by V₁ T₇ (47.58) and minimum (32.58) with T₂ T₉ treatment combinations. However, relatively higher yield parameters were observed in A1 with rhizobium, PSB, MgSO₄ and ZnSO₄ treatments.

With respect to seed quality parameters no significant differences was seed due to seed treatments and varieties interactions However in ICCV-2 seeds treated with rhizobium, PSB MgSO₄ and ZnSO₄ sowed relatively higher seedling vigour index compared to A-1 while, higher EC (0.454 dsm-1) was recorded in ICCV-2 compared to A-1 (0.409 dsm-1) and this difference in EC values may be due to bigger seed size and peppery seed coat which leads to more leaching of food reserves and results are in conformity with Kumbar (1999), Patil (2000) and Merwde (2000) in chickpea.

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APPENDICES

Table 1: Effect of Seed Treatment on Plant Height, Number of Branches and Number of Pods per Plant in Chickpea Genotypes (Pooled Analysis) **

Treatments	At Harvest								
	Plant Height (Cm)			Number of Branches			Number of Pods Per Plant		
	V ₁	V ₂	Mean	V ₁	V ₂	Mean	V ₁	V ₂	Mean
T ₁	48.08	50.30	49.19	24.13	22.03	23.08	46.37	36.91	41.64
T ₂	47.58	48.67	48.13	23.47	21.53	22.50	43.90	35.07	39.49
T ₃	47.17	49.47	48.32	23.07	20.53	21.80	43.88	34.20	39.04
T ₄	46.95	50.78	48.87	23.07	20.90	21.99	42.87	36.17	39.52
T ₅	47.75	50.45	49.10	24.20	20.53	22.37	44.05	35.62	39.84
T ₆	49.38	51.33	50.36	25.40	22.47	23.94	48.75	38.42	43.59
T ₇	48.88	50.23	49.56	25.60	21.53	23.57	47.58	37.83	42.71
T ₈	47.40	48.70	48.05	23.53	19.37	21.45	41.13	34.93	38.03
T ₉	46.83	46.88	46.86	21.07	18.50	19.79	37.70	32.58	35.14
Mean	47.78	49.65	48.71	23.73	20.82	22.27	44.03	35.75	39.89
Comparison for means of		S.Em±	CD (5%)		S.Em±	CD (5%)		S.Em±	CD (5%)
V		0.21	0.60		0.16	0.45		0.27	0.77
T		0.44	1.27		0.33	0.94		0.57	1.64
V x T		0.63	NS		0.46	NS		0.80	2.31

*(2007-08 and 2008-09 rabiseason)NS – Non Significant

Table 2

Varieties :	V ₁ : A-1 V ₂ : ICCV-2				
Seed treatments:	T ₁ : ZnSO ₄ (1 gm/kg)	T ₂ : CaCl ₂ (1 gm/kg)	T ₃ : FeSO ₄ (1 gm/kg)	T ₄ : B (1 gm/kg)	T ₅ : Mg SO ₄ (1 gm/kg)
	T ₆ : Rhizobium (20 gm/ kg)	T ₇ : PSB (20 gm/ kg)	T ₈ : Panchagavya (3%)	T ₉ : Control	

Table 3: Effect of Seed Treatment on Seed Yield Per Plant, Per Plot and Per Hectare in Chickpea Genotypes (Pooled Analysis) **

Treatments	Seed Yield Per Plant (G)			Seed Yield Per Plot (Kg)			Seed Yield Per Hectare (Q)		
	V ₁	V ₂	Mean	V ₁	V ₂	Mean	V ₁	V ₂	Mean
T ₁	13.63	11.82	12.73	1.12	1.00	1.06	31.39	26.85	29.12
T ₂	13.51	11.36	12.44	1.11	0.94	1.03	30.87	26.20	28.54
T ₃	13.05	11.31	12.18	1.04	0.94	0.99	29.03	26.02	27.53
T ₄	13.03	11.58	12.31	1.11	0.97	1.04	30.77	26.39	28.58
T ₅	13.32	11.67	12.50	1.10	0.95	1.03	30.69	27.18	28.94
T ₆	15.10	13.20	14.15	1.15	1.05	1.10	31.07	29.07	30.07
T ₇	14.74	12.72	13.73	1.15	0.98	1.07	31.25	27.68	29.47
T ₈	12.27	11.53	11.90	1.02	0.91	0.97	28.15	25.22	26.69
T ₉	11.47	10.72	11.10	1.00	0.84	0.92	27.82	23.81	25.82
Mean	13.35	11.77	12.56	1.09	0.95	1.02	30.12	26.49	28.30
Comparison for means of		S.Em±	CD (5%)		S.Em±	CD (5%)		S.Em±	CD (5%)
V		0.11	0.33		0.01	0.02		0.23	0.67

Table 3: Contd.,									
T		0.24	0.69		0.02	0.05		0.49	1.42
V x T		0.34	NS		0.02	NS		0.70	NS

*(2007-08 and 2008-09 rabiseason) NS – Non Significant

Table4

Varieties :	V ₁ : A-1 V ₂ : ICCV-2				
Seed treatments:	T ₁ : ZnSO ₄ (1 gm/kg)	T ₂ : CaCl ₂ (1 gm/kg)	T ₃ : FeSO ₄ (1 gm/kg)	T ₄ : B (1 gm/kg)	T ₅ : Mg SO ₄ (1 gm/kg)
	T ₆ : Rhizobium (20 gm/ kg)	T ₇ : PSB (20 gm/ kg)	T ₈ : Panchagavya (3%)	T ₉ : Control	

Table 5: Effect of Seed Treatment on Germination (%), Vigour Index and Electrical Conductivity (Dsm⁻¹) in Chickpea Genotypes (Pooled Analysis)**

Treatments	Germination (%)			Vigour Index			Electrical Conductivity (Dsm ⁻¹)		
	V ₁	V ₂	Mean	V ₁	V ₂	Mean	V ₁	V ₂	Mean
T ₁	95.83 (78.19)	95.50 (77.72)	95.66 (77.95)	2744	2848	2796	0.407	0.425	0.416
T ₂	95.48 (77.69)	94.51 (76.42)	94.99 (77.04)	2651	2557	2604	0.403	0.440	0.422
T ₃	94.66 (76.61)	94.52 (76.43)	94.59 (76.52)	2589	2657	2623	0.412	0.473	0.443
T ₄	95.88 (78.26)	95.61 (77.87)	95.74 (78.08)	2637	2699	2668	0.417	0.467	0.442
T ₅	95.44 (77.64)	95.62 (77.89)	95.53 (77.76)	2759	2748	2753	0.405	0.453	0.429
T ₆	97.31 (80.53)	97.01 (80.01)	97.16 (80.27)	2895	2949	2922	0.393	0.422	0.408
T ₇	96.64 (79.41)	96.59 (79.33)	96.61 (79.37)	2840	2824	2832	0.387	0.432	0.410
T ₈	94.77 (76.75)	95.26 (77.39)	95.01 (77.07)	2607	2593	2600	0.425	0.483	0.454
T ₉	93.05 (74.68)	92.30 (73.86)	92.67 (74.27)	2464	2460	2462	0.430	0.488	0.459
Mean	95.45 (77.65)	95.21 (77.33)	95.33 (77.49)	2687	2703	2695	0.409	0.454	0.431
Comparison for means of		S.Em±	CD (5%)		S.Em±	CD (5%)		S.Em±	CD (5%)
V		0.15	NS		22.12	NS		0.003	0.007
T		0.32	0.93		46.92	134.85		0.005	0.015
V x T		0.46	NS		66.36	NS		0.008	NS

*(2007-08 and 2008-09 rabiseason) NS – Non Significant Arcsine transformed values in parenthesis

Table 6

Varieties :	V ₁ : A-1 V ₂ : ICCV-2				
Seed treatments:	T ₁ : ZnSO ₄ (1 gm/kg)	T ₂ : CaCl ₂ (1 gm/kg)	T ₃ : FeSO ₄ (1 gm/kg)	T ₄ : B (1 gm/kg)	T ₅ : Mg SO ₄ (1 gm/kg)
	T ₆ : Rhizobium (20 gm/ kg)	T ₇ : PSB (20 gm/ kg)	T ₈ : Panchagavya (3%)	T ₉ : Control	

